AMENDMENTS TO THE CLAIMS

1.   (Original) A method of processing a digital image, each pixel of the digital image having only a single sampled value, the method comprising interpolating values of a first color at pixels where the first color was not sampled, the interpolation of the first color value at a given pixel including:

determining likelihoods of the given pixel belonging to the same region as each of at least two other pixels having sampled values of the first color, the other pixels in different directions relative to the given pixel; and

using the likelihoods and the sampled values of the other pixels to interpolate the first color at the given pixel.

2.   (Original) The method of claim 1, wherein at least two of the directions are orthogonal.

3.   (Original) The method of claim 1, wherein the directions include north, south, east and west of the given pixel.

4.   (Original) The method of claim 1, wherein the sampled pixel values are of neighboring pixels nearest the given pixel.

5.   (Original) The method of claim 1, further comprising additionally using sampled values of a second color to compute terms for correcting the sampled values of the first color.

6.   (Original) The method of claim 5, wherein using the sampled values of the second color to correct a sampled value of the first color includes taking a difference between the sampled value at the given pixel and the sampled value of the second color at a neighbor, the neighbor lying in the same direction as the pixel being corrected.

7. (Original) The method of claim 6, wherein the likelihoods are used to compute a weighted average of the sampled values and correction terms.

8. (Original) The method of claim 1, wherein determining the likelihoods includes applying a similarity function to differences between sampled values.

9. (Original) The method of claim 8, wherein determining the likelihoods includes using the differences to index a lookup table of precomputed likelihoods.

10. (Original) The method of claim 1, wherein the likelihoods are used to compute a weighted average of the sampled values.

11. (Original) The method of claim 1, wherein the first color is green, whereby missing information in a green color plane is interpolated.

12. (Original) The method of claim 11, wherein missing green information (I_G) at a given pixel (i, j) is computed as

$$I_G(i,j) = \frac{\sum_{(a,b)\in N}\{\lambda[m(i,j)-m(i+2a,j+2b)]+m(i+a,j+b)\}w_{a,b}(i,j)}{\sum_{(a,b)\in N}w_{a,b}(i,j)}.$$

where $m(i,j)$ is a sampled pixel value, a and b are components of a vector (a,b), λ is a tunable parameter, N is a neighborhood of pixels, and $w_{a,b}$ are weights corresponding to the vector (a,b).

13. (Original) The method of claim 12, wherein the weights $w_{a,b}$ are computed as $w_{a,b}(i,j) \stackrel{\wedge}{=} \rho[|m(i+2a,j+2b)-m(i,j)|+|m(i+a,j+b)-m(i-a,j-b)|]$, where $\rho[\cdot]$ is a similarity function.

14.   (Original) The method of claim 1, wherein the digital image corresponds to a Bayer CFA.

15.   (Original) The method of claim 1, further comprising interpolating at least one other color at each pixel.

16.   (Original) The method of claim 15, wherein the likelihoods are used to interpolate missing information in one color plane, and wherein bilinear interpolation is used to interpolate missing information in other color planes, wherein the interpolation includes using sampled and interpolated green pixel values.

17.   (Currently amended) The method of claim 15, further comprising interpolating additional missing values, the interpolation of a second color value at the given <u>pixel</u> including:
        using sampled and interpolated first color values to determine likelihoods of the given pixel belonging to the same region as neighboring pixels; and
        using the likelihoods and sampled second color values in the neighborhood to interpolate the second color value at the given pixel.

18.   (Original) The method of claim 17, further comprising computing correction terms; and using the correction terms to correct the sampled second color values in the neighborhood.

19.   (Original) The method of claim 18, wherein a missing color value $I_c(i,j)$ at pixel (i,j) is computed as

$$I_c(i,j) = \frac{\sum\limits_{(a,b)\in N_{G,c}^{(i,j)}} \left[I_G(i,j) - I_G(i+a,j+b) + m(i+a,j+b) \right] u_{a,b}(i,j)}{\sum\limits_{(a,b)\in N_{G,c}^{(i,j)}} u_{a,b}(i,j)}$$

where $c \in \{R,B\}$, and

$$N_{G,c}^{(i,j)} \begin{cases} \{(-1,0),(1,0)\}, & \begin{array}{l} c = R, i \text{ is odd, } j \text{ is even, or} \\ c = B, i \text{ is even, } j \text{ is odd} \end{array} \\ \{(0,-1),(0,1)\}, & \begin{array}{l} c = B, i \text{ is odd, } j \text{ is even, or} \\ c = R, i \text{ is even, } j \text{ is odd} \end{array} \\ \{(-1,-1),(-1,1)\},\{(1,-1),(1,1)\}, & \begin{array}{l} c = R, i \text{ is odd, } j \text{ is odd, or} \\ c = B, i \text{ is even, } j \text{ is even} \end{array} \end{cases}$$

and

$$u_{a,b}(i,j) \overset{\Delta}{=} \rho\Big[\big|I_G(i,j) - I_G(i+a,j+b)\big|\Big].$$

20. (Currently amended) The method of claim 15, wherein interpolating at least one of the other missing colors includes:

making an initial estimate for the other missing colors;

transforming an output image into a luminance-chrominance color space, the output image including sampled and interpolated values of the [[fist]] first color, and sampled values of the other colors;

smoothing the luminance and chrominance bands;

transforming the output image back to its original color space; and

resetting measured values and green interpolated values in the output image

21. (Currently amended) The method of claim 20, wherein each step is a linear operation, and wherein the steps are performed by applying a concatenation of the linear operations to the output demosaic image.

22. (Currently amended) The method of claim 15, wherein affine interpolation of at least one of the other colors is performed as

$$I_d(x,y) = t_{d,c}(x,y)I_c(x,y) + s_{d,c}(x,y)$$

where I_d is the color to be interpolated at pixel coordinates (x,y), I_c is either the green sampled value or the green interpolated value, $s_{d,c}$ is a slowly varying function of a shift in color c, and $t_{d,c}$ is a slowly varying function that can change [[the]] an intensity gradient.

23.   (Original) Apparatus comprising a processor for interpolating missing values in a first color plane of a mosaic image, the interpolation of a given pixel in the color plane including:

determining likelihoods of neighbors belonging to the same region as the given pixel, the neighbors having sampled values of the first color, at least two of the neighbors lying in different directions relative to the given pixel; and

using the likelihoods and the sampled values to interpolate a first color value for the given pixel.

24.   (Original) The apparatus of claim 23, wherein the processor also uses sampled values in a second color plane to compute correction terms for the sampled values in the first color plane.

25.   (Original) The apparatus of claim 24, wherein using the sampled values in the second color plane includes taking a difference between the sampled value at the given pixel and a sampled value in the second color plane at a neighbor, the neighbor lying in the same direction as the sampled value being corrected.

26.   (Original) The apparatus of claim 25, wherein the likelihoods are used to compute a weighted average of the sampled values and the correction terms.

27.   (Original) The apparatus of claim 23, wherein determining the likelihoods includes applying a similarity function to differences between sampled values.

28.   (Original) The apparatus of claim 23, wherein the first color is green, whereby missing information in a green color plane is interpolated.

29.   (Original) The apparatus of claim 23, wherein the processor also interpolates at least one other missing color value at each pixel.

30.   (Original) The apparatus of claim 23, wherein the processor further interpolates a second color plane, the interpolation of a second color value at the given pixel including:

using sampled and interpolated first color values to determine likelihoods of the given pixel belonging to the same region as neighboring pixels; and

using the likelihoods and sampled second color values in the neighborhood to interpolate the second color value at the given pixel.

31.   (Currently amended) The apparatus of claim 23, wherein the processor further interpolates additional color planes, the interpolation of the additional color planes including:

making an initial estimate for missing information in the additional color planes;

transforming an output image into a luminance-chrominance color space, the output image including sampled and interpolated values of the [[fist]] first color, and sampled values of the other colors;

smoothing the luminance and chrominance bands;

transforming the output image back to its original color space; and

resetting measured values and green interpolated values in the output image.

32.   (Currently amended) The apparatus of claim 23, wherein the processor further interpolates a second color plane, the interpolation of a second color value at the given pixel at pixel coordinates (x,y) performed according to:

$$I_d(x,y) = t_{d,c}(x,y)I_c(x,y) + s_{d,c}(x,y)$$

where I_d is the second color value, I_c is either the green sampled value or the green interpolated value at pixel coordinates (x,y), $s_{d,c}$ is a slowly varying

function of a shift in color c, and $t_{d,c}$ is a slowly varying function that can change [[the]] an intensity gradient.

33.   (Original) Apparatus for processing a mosaic image, the apparatus comprising:

means for using sampled values in a color plane of the mosaic image to determine the likelihoods of a given pixel belong to the same region as at least two different neighbors lying in different directions; and

means for using the likelihoods and sampled values in the different directions to interpolate a value at the given pixel, the interpolated value being in the color plane.

34.   (Original) The apparatus of claim 33, further comprising means for aquiring the mosaic image.

35.   (Original) A digital camera comprising:

a photosensor array for acquiring mosaic images; and

a digital signal processor for processing the mosaic images, the processing including interpolating missing values from sampled values in the mosaic image, the interpolation of a given pixel in a given color plane including determining the likelihoods of neighbors belonging to the same region as the given pixel, the neighbors being in at least two different directions relative to the given pixel; and using the likelihoods and the sampled values of the neighbors to interpolate the given color at the given pixel.

36.   (Original) The digital camera of claim 35, wherein the processing includes using sampled values of a second color to compute terms for correcting the sampled values of the given color.

37.   (Original) An article for instructing a processor to process a mosaic image, the article comprising memory encoded with instructions for instructing

the processor to interpolate missing values of a first color, the interpolation of the first color of a given pixel including determining likelihoods of neighbors having sampled values of the first color being in the same region as the given pixel, and using the sampled values and the likelihoods of those neighbors to interpolate the first color at the given pixel, at least one neighbor being in a first direction relative to the given pixel, at least one neighbor being in a second direction relative to the given pixel, where the first and second directions are orthogonal.

38.   (Original) The article of claim 37, wherein the processing includes using sampled values of a second color to compute terms for correcting the sampled values of the first color.